

Claims

1. An X-ray image diagnostic apparatus, characterized by comprising:

an X-ray source that irradiates X-rays to a subject;

an X-ray flat panel detector that is provided oppositely to the X-ray source and detects transmitted X-rays from the subject as an X-ray image;

image processing means for applying image processing to the X-ray image detected by the X-ray flat panel detector; and

image display means for displaying the X-ray image having undergone the image processing in the image processing means, wherein the image processing means includes:

storage means for storing plural sets of residual image data, acquired in advance from X-ray images in X-ray image acquisition modes from the X-ray flat panel detector before an actual measurement, in correspondence with the X-ray image acquisition modes; and

residual image correction means for correcting residual image data contained in an X-ray image in the actual measurement from the X-ray flat panel detector, using the residual image data stored in the storage means.

2. The X-ray image diagnostic apparatus according to Claim 1, wherein the image processing portion includes:

an image memory that stores one frame of the residual

image data from the X-ray flat panel detector;

an attenuation quantity storage portion that stores quantities of attenuation of first and subsequent frames of the residual image data read out from the image memory;

a computing unit that reads out the quantities of attenuation of the first and subsequent frames of the residual image data in response to a time on the basis of one frame of the residual image data stored in the image memory, and subtracts the read quantities of attenuation of the residual image data from a signal outputted from the X-ray flat panel detector; and

a control portion that controls the image memory, the attenuation quantity storage portion, and the computing unit on the basis of respective signals, including control signals for each of the X-ray image acquisition modes including a radiographic signal and a fluoroscopic signal, and an image synchronizing signal to enable a display on the display means.

3. The X-ray image diagnostic apparatus according to Claim 1, wherein:

the storage means stores plural frames of images of a residual image while X-rays are shielded after an X-ray image is acquired at a specific X-ray dose in advance.

4. The X-ray image diagnostic apparatus according to Claim 1, wherein the image processing means includes:

plural image memories, each of which stores one frame

of residual image data from the X-ray flat panel detector;

plural attenuation quantity storage portions that store quantities of attenuation of first and subsequent frames of the residual image data read out from the image memories;

a weight addition quantity storage portion that reads out quantities of attenuation of the first and subsequent frames of the residual image data in response to a time on the basis of one frame of the residual image data stored in each of the image memories, subjects the read quantities of attenuation of residual images to weighting addition depending on magnitude of a quantity of remaining residual images, and stores weight addition quantities;

a computing unit that reads out the weight addition quantities stored in the weight addition quantity storage portion in response to a time, and subtracts the read weight addition quantities from a signal outputted from the X-ray flat panel detector; and

a control portion that controls the image memories, the attenuation quantity storage portions, and the weight addition quantity storage portion on the basis of respective signals, including control signals for each of the X-ray image acquisition modes including a radiographic signal and a fluoroscopic signal, and an image synchronizing signal to enable a display on the display means.

5. The X-ray image diagnostic apparatus according to

Claim 1, wherein the image processing portion includes:

an image memory that stores one frame of residual image data from the X-ray flat panel detector;

a first switch that switches an output of a quantity attenuation of an image of a residual image read out from the image memory depending on a read pixel matrix of the X-ray flat panel detector;

plural attenuation quantity storage portions, each of which stores quantities of attenuation of first and subsequent frames of the residual image data on the basis of one frame from the image memory switched by the first switch, in correspondence with the read pixel matrix of the X-ray flat panel detector;

a second switch that reads out a quantity of attenuation of a residual image stored in the attenuation quantity storage portions in response to a time, and makes a switch to the read quantity of attenuation of the residual image data;

a computing unit that subtracts the quantity of attenuation of the residual image data switched by the second switch from a signal outputted from the X-ray flat panel detector; and

a control portion that controls the image memory, the attenuation quantity storage portions, and the first and second switches on the basis of respective signals, including control signals for each of the X-ray image acquisition modes including

a radiographic signal and a fluoroscopic signal, and an image synchronizing signal to enable a display on the display means.

6. The X-ray image diagnostic apparatus according to Claim 1, wherein the image processing means includes:

an image memory that stores one frame of residual image data from the X-ray flat panel detector;

a first switch that switches an output of a quantity of attenuation of a residual image read out from the image memory depending on whether the X-ray image acquisition mode is a single radiographic mode or a continuous radiographic mode;

plural attenuation quantity storage portions, each of which stores quantities of attenuation of first and subsequent frames of the residual image data on the basis of one frame from the image memory switched by the first switch, in correspondence with the single radiographic mode and the continuous radiographic mode;

a second switch that reads out a quantity of attenuation of the residual image stored in the attenuation quantity storage portions in response to a time depending on the single radiographic mode or the continuous radiographic mode, and makes a switch to the read quantity of attenuation of the residual image;

a computing unit that subtracts the quantity of attenuation of the residual image switched by the second switch from a signal outputted from the X-ray flat panel detector;

and

a control portion that controls the image memory, the attenuation quantity storage portions, and the first and second switches on the basis of respective signals, including control signals for each of the X-ray image acquisition modes including a radiographic signal and a fluoroscopic signal, and an image synchronizing signal to enable a display on the display means.

7. The X-ray image diagnostic apparatus according to Claim 6, wherein:

the control portion determines a quantity of the residual image generated from continuous exposures in response to an exposure time in the continuous radiographic mode.